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WATERWAYS: THEIR PLACE IN OUR TRANSPORTATION SYSTEM

I

Like almost everyone else who has advocated waterway development, I started some years ago with the general assumption that transportation by water was as a rule cheaper than transportation by rail; and that since the United States was blessed by nature with so extensive and so advantageously distributed a system of navigable lakes and rivers, it might safely be concluded without extended investigation that the burden of proof was upon the opponents of waterway development to show why almost any considerable lake or river should not be made and kept navigable at public expense, and why many of these lakes and rivers should not be connected by artificial canals. A greater knowledge, however, of the actual history and present conditions of internal waterways in this and other countries and a clearer understanding of the fundamental principles underlying transportation development has led to a substantial modification of my previous views upon this subject.

I am no longer able to explain the failure of many waterway projects and the great decline of the traffic upon others solely by the improper competitive methods of the railroads or by the inadequate size or depth of the waterways. I have no doubt that these things

have materially affected the results, but I have come to appreciate that even more potent than these has been the effect of fundamental commercial principles and economic laws which will continue to operate even after the improper competition of railroads has been checked and the physical condition of the waterways has been improved. So far as transportation is concerned, I have come to believe that both from the point of view of efficiency and from the point of view of cost the railroads possess decided advantages over most artificial waterways and over many natural waterways, and that the burden of proof has shifted from the opponents to the proponents of any particular waterway development. This is not to say that some waterway projects may not be justified on navigation grounds alone; that others may not properly be developed as a part of a conservation program including the control of floods, the development of water power, the disposal of drainage, and the purification of the water supply; or, indeed, that a combination of waterways and railways may not furnish the most advantageous transportation system for the country as a whole. I wish to emphasize, however, that the time has come when we should cease to take for granted the feasibility of all waterway projects and should consider each project on its merits and in the light of all the data that are available. It has now become convincingly apparent that the problem of internal navigation in this country is a part of the greater problem of our transportation system as a whole.

II

Let us consider briefly the reasons that lead to the belief that the burden of proof now lies with the advocates of waterway development. First, as to certain advantages possessed by the railroads. Natural waterways usually follow winding courses which may not run in the direction of the natural flow of traffic. Commerce once flowed chiefly along these winding ways because they were then the best available avenues of transportation. Today the railroad has enabled commerce to establish short and more direct routes along which trade has tended to concentrate. The railroad may cut through or pass over natural obstacles which the waterway must pass around. The Lakes-to-the-Gulf waterway

will be nearly twice the length of the railroad route; that is to say, 1,610 miles by water as compared with 930 miles via the Illinois Central. That has a great bearing when one comes to consider ton-mile rates on the one and on the other. The ton-mile rate on the one will have to be only about one-half that on the other in order to put them on a parity. The usual statistics of ton-mile rates may, therefore, be quite misleading.

Railroads can be operated day and night, while night traffic is impossible on some and greatly restricted on other waterways. Railroad traffic is comparatively uninterrupted by climatic or seasonal conditions. Waterways in the northern part of our country are obstructed by ice for a number of months during the year.[1] The figures vary, depending upon the character of the stream and its location, but it is a safe statement that notwithstanding the interruptions which do occur on railroads, climatic conditions are more disadvantageous to waterways. The importance of this principle is increased when we understand that traffic which must use the railroads during part of the season tends to continue to use them at other times.

Shifting channels and varying levels are important disadvantages in rivers. The variations in the depth of the water is a great disadvantage on the Mississippi River. I remember having seen statistics showing that the height of the Mississippi at St. Louis varied some forty feet during the year. You cannot build a perpendicular wharf or dock because the difference in the levels is prohibitive. The result is that we have that survival of the fittest which perhaps to many of us seems archaic, but which after all is perhaps the best—the floating wharf, which rises and falls with the stream, while a cobblestone bank furnishes the incline up and down which the freight is moved.

Railroads can provide practically unlimited extensions on spur-tracks for the collection and delivery of freight for commodities and industries remote from their main lines. Waterway branches and feeders are frequently impossible and always comparatively expensive. The unit of railway transportation is the car, which permits a thousand conveniences and economies that are impossible

[1] On the Erie Canal the open season has averaged only 204 days.

where the unit is the steamboat or the barge.[1] In this unit of the car the railway can collect and distribute its freight without rehandling over a range utterly impracticable by water.

Another of the advantages of rail transportation is that transshipment from car to car is cheaper and quicker than transshipment from boat to boat. While accurate statistics are not available and the differences are probably not great, my own judgment is that the cost of transfer from car to car is cheaper than from boat to boat except in certain cases of bulk freight. It ought not to apply

[1] During the recent visit of the Chicago Terminal Commission to Europe, among other things which naturally attracted attention was the diminutive size of the railroad freight car in Great Britain and on the Continent; and yet in talking with railroad men and business men, both in Great Britain and on the Continent, we found strong justification for what otherwise seemed a ridiculously small car. We found that in countries of small distances the practice prevails of maintaining centrally located warehouses in which the commodities are kept on store and whence they can be delivered in any part of the country on a day's notice; in this way a system has grown up which has relieved the country merchant from carrying large stores of goods on hand. He deals directly with the central depot in London, Liverpool, and Manchester. The result is that he does not wish the large car and would not make use of it even at a lower rate, because he does not require goods in great quantity. Business has adjusted itself to the smaller unit and a great advantage has resulted to the dealers. Now in our country we have built up a practice different from this. We have a large, forty-ton car, with a constant tendency to increase the size; but our railroads have been to some extent compelled by economic and commercial necessity to permit the use of the car for storage purposes to an unfortunate degree. The weakest point in American railroad transportation is the inefficiency in the freight-car movement. In making this statement, however, I am excepting the greater problem of railway terminals, of which the practice of freight-car demurrage is only a part.

One of the most interesting experiments the Commission found in England is the one being conducted by Mr. Gatty. He thinks the secret of transportation reform in Great Britain is practically to abolish the box car, and to use only a car with a platform upon which will be placed movable conveyors of different sizes. The cars would be sent from one point to another, and the conveyors would be loaded and unloaded at the depots immediately upon their arrival. In that way the rolling equipment would be constantly utilized, while the only part used for storage would be the conveyor or container. It may be that Mr. Gatty has made an important suggestion for England with its system of small cars, and that the scheme is susceptible of some application in this country, especially in the terminal handling of freight. Mr. Gatty came to this country some time ago and went to see Mr. J. J. Hill, but I have not seen any indication that Mr. Hill has adopted his idea. Among the difficulties in the way of adopting such a suggestion are the great size of our box cars, the large investment that has been made in our rolling stock, and the enormous distances that the cars move. The conveyors would have to go long distances and then be returned empty or partially filled.

to such commodities as grain, of course, which can be lifted mechanically. The cost of transshipment from barge to ocean steamer is often cheaper, but the difficulty is that where freight does not originate on the banks of the waterway the delay and cost of transshipment usually give the entire transportation service to the railroad. This has been true in other countries as well as in the United States. In France transshipments are rare, and in Germany they are accomplished by means of a policy which fixes merely a nominal charge for this service.[1]

Again, railway transportation is speedier than water transportation. The average daily movement of the American freight car does not establish a different conclusion, although it shows an appalling inefficiency in railway operation which real waterway competition might beneficially affect. The greater speed afforded by the railways is of sufficient importance with some kinds of traffic to make water competition impracticable on this traffic.

Another advantage of the railways has been their decidedly superior administration and organization. Waterway administration in this country, especially in its larger co-operative aspects, has been most discouragingly inefficient. Waterways have never approximated the degree of efficiency of co-operative interrelationship that is evidenced by the standard gauge of railways, the interchange of cars, and the establishment of through routes and joint traffic arrangements.[2]

[1] See *infra*, p. 650.

[2] When the railways came into England they found the country already occupied by an extensive system of internal waterways which had control of the market. Notwithstanding this, many of the canals of Great Britain have practically gone to the wall in competition with the railroads. The old canals never worked out any system of interrelationship between themselves in any effective way. The same difficulty applied to railroads when they were first established. The first theory of railroad transportation was that the railway company would build the railway upon which various individuals or associations of individuals were to run their own rolling stock. That plan did not work, however, and so the railway company soon became the operator of the whole system. That is not the case on the canals. The owners of the canal do not usually own the boats, and so they do not have the incentive to organize in an efficient way on the administrative side. The work of maintaining the canal is—comparatively—a lazy man's job, and the law of progress which compels us to be more efficient under active commercial competition does not have the chance on the canals that it has even on the railroads, where also private monopoly tends to inefficiency.

Finally, railroads practically insure their freight. The railroad is responsible for damages, while waterways are not. As a rule, waterways compel the shipper to insure his own freight, and insurance rates on water freight must always be taken into consideration in figuring the total cost of water transportation. The railway bill of lading also has a great advantage over the waterways receipt.

Having outlined the many advantages possessed by railroads from the standpoint of efficiency of service, we may turn to a consideration of the relative cost of the two types of transportation. It is here that waterways are commonly believed to have the overwhelming advantage. We shall find, however, that such is not always the case.

In computing the relative cost of transportation by water and by rail it has been a common practice to overlook entirely the question of the cost of construction of the waterway. Railroad rates are designed to cover overhead charges, but waterway rates, as a rule, need make no allowance for capital cost, for the reason that the waterway is usually constructed and maintained at the expense of the state. The taxes to cover these state expenditures must therefore be added to the water rates in order to give us the inclusive cost. Without attempting at this place a conclusive proof of the question of cost, a few citations of importance may be made. The average cost of American railroads is approximately $60,000 per mile of single track or $100,000 per mile of double track. Estimates made by Professor Moulton seem clearly to show that the present enlargement of the Erie Canal will probably cost $330,000 per mile, or $260,000 if we include that portion of the Hudson River which the canal will make available as a connected waterway from Buffalo to New York.[1] It appears that the total cost of this project will ultimately be in the neighborhood of $175,000,000. This means at 4 per cent an annual interest charge of $7,000,000, which must be met by increased taxation. Upon this basis the inclusive cost of transportation on the Erie Canal would be substantially greater than on the railroads.

[1] "The Cost of the Erie Barge Canal," *Journal of Political Economy*, May, 1915, p. 494.

Comparisons have been made by Professor Moulton of the inclusive costs of transportation by railways and by all the waterways in Germany, and he finds that with the exception of the Rhine River, which has required almost no regulative work, the cost of transportation is substantially higher by water than by rail. Two German railway authorities, Rathenau and Cauer, have made a similar comparison between the cost of the Rhine-Elbe Canal and an all-freight railroad from the Rhine to Berlin, and have concluded that such a railroad would cost one-half as much as the waterway and would have a greater capacity than a canal operating 600-ton barges, which is the customary type of boat for canal traffic in Germany. Similar comparisons have been made by such men as Colson in France and Acworth in England. These estimates certainly establish the prima facie presumption that, if interest on the capital invested be considered, on many, if not on most, inland waterways the inclusive cost of transportation is greater than on railways. There are important exceptions, however, to this general conclusion.

Projects requiring a public expenditure which, even though large in amount, is relatively small when we consider the total length of water haul which such expenditures make available, undoubtedly offer decisive advantages of economy and often of capacity. Such are the Great Lakes, upon which it is necessary to make expenditures only for particular connections, like the Sault Ste. Marie Canal or at terminal harbors. Transportation development of our great rivers depends upon similar considerations, modified, as they should be, by the justification of large expenditures for conservation purposes, such as the control of floods, the drainage of swampy and overflowed areas, the development of water power, and the purification of the water supply. In a comprehensive, intelligent, and beneficent conservation program, improvement of navigation will often be abundantly justified as an incident of a larger plan, where it might not be justified if it stood alone.

It will be helpful to take a summary view of the actual results of waterway expenditures in this and other countries. The total expenditure in the United States for internal waterway improvement

cannot be far from three-quarters of a billion dollars. Not all of this amount has been expended for the improvement of navigation, but most of it has been spent in the belief that it would be justified in large part by the resulting improvement in transportation facilities. Much of this expenditure has been abundantly justified. The Erie Canal alone reduced the cost of transporting freight from the seaboard to Ohio to one-tenth of the previous cost by land, and traffic on this water route went up by leaps and bounds until 1880, when it amounted to 4,500,000 tons. In that year the canals of New York state carried a total of 6,500,000 tons. In the same year the traffic on the Mississippi River at St. Louis was over 1,250,000 tons. Upon the other hand, much of the public money spent upon canals was undoubtedly wasted. Many projects were never completed and many were so situated or constructed that they were foredoomed to failure from the start. Out of a total of 4,633 miles of canals, 2,444 miles have been abandoned; and the *Preliminary Report of the Inland Waterways Commission*, in 1908, gave only 2,189 miles of federal, state, and private canals as then in operation. The economic revolution and commercial expansion that accompanied and were facilitated by the substitution of the steamboat and the barge for the wagon and the sled have been followed by the greater revolution which the railroad has wrought in our methods and facilities of transportation. In the course of this revolution the waterway has steadily lost ground until today only the Ohio River and the Great Lakes are really able to make a creditable showing in volume of traffic. On the Lakes this showing is due to heavy bulk freight, such as ore, coal, and grain, carried in vessels of special design, constantly increasing in size. It is traffic of this same sort, especially coal, that has enabled the Ohio River, alone of all our rivers, to hold its own in the volume of its traffic. On the Erie Canal the great tonnage of 1880 (4,500,000 tons) had fallen to less than 2,000,000 tons in 1905. The Federal Engineering Board stated, in 1909, that "the entire commerce of the Mississippi River system, including all tributaries except the Ohio, was reported in 1889 as 12,492,535 tons; while in 1906 it was only 4,304,288 tons." Notwithstanding the maintenance of an eight-foot channel from St. Louis to New Orleans, and the improvements

on the Upper Mississippi, the total river tonnage at St. Louis diminished from 1,332,885 tons in 1886 to 365,920 tons in 1908, and of this remainder not over 49,530 tons represented traffic with towns on the Mississippi below Cairo.

The National Waterways Commission states that grain shipments on the Upper Mississippi River have now ceased almost entirely. The receipts of cotton at New Orleans by river have steadily decreased since 1880, while the receipts by rail have rapidly increased. At St. Louis the receipts of cotton by river fell from 13,500 bales in 1890 to 3,000 bales in 1905.

Disconcerting as these figures are, they find their parallel in the canals of Great Britain. The total tonnage on the 2,416 miles of navigable canals in England and Wales declined nearly 1,000,000 tons between 1888 and 1905, while the railroad traffic increased nearly 200,000,000. Internal waterway traffic in that country, as in this, is now almost wholly confined to low-grade bulk freight, and the volume of even this traffic is declining. This, moreover, has occurred in a country where the interruptions to traffic from flood, drought, and ice are almost negligible when compared with American conditions. The Grand Junction Canal passes through one hundred miles of farm lands in order to reach London, but the Royal Commission reports that "in 1905 it carried but 5,812 tons of agricultural produce out of a total canal traffic of 1,794,233 tons."

The internal waterways of Germany and France show precisely the same results as do those in England and America with regard to the character of the traffic, but altogether different results with respect to its volume. This is due to a fundamental difference in government attitude toward both canals and railroads. Germany and France have apparently accepted the economic law which tends to confine the traffic of waterways to low-grade bulk freight, and both countries have pursued a consistent policy of diverting as much as possible of this class of traffic from railroads to waterways. In order to accomplish this result both countries make direct financial contributions to the waterways in aid of this traffic, and both countries impose arbitrary restrictions upon the railroads in respect to the same class of traffic. The precise methods, however, are different in important respects in the two countries.

In Germany the ton mileage of waterways has increased from 1,798,000,000 in 1875 to 9,300,000,000 in 1905. This is a greater increase than is shown by the railways in the same period, although the railway mileage has more than doubled, while the canal mileage has practically stood still. The explanation for this is largely the diversion of heavy bulk traffic to the waterways, in consequence of the direct control of the government over the railways. Railroads have been developed as feeders from coal fields and ore fields to waterways, and railroad rates on low-class bulk freight have been maintained by the government at a level sufficiently high to force great quantities of this traffic to the waterways. Tolls have been charged on canals but not on rivers. Transshipment facilities have been provided and operated at public expense, with nominal charges, which create substantial deficits that are met by taxes.

The Rhine River is the most important and the most significant waterway in Germany. Its course is unusually straight, it has little current, no locks, no tolls, and comparatively little fluctuation in flow. It is closed by ice only seventeen days in the year and by flood only two days. Of its imports or up-river traffic, 47 per cent consists of ores; 19 per cent, of grain; 10 per cent, of wood, and 4 per cent, of coal—these four classes aggregating 80 per cent of the total tonnage. Of its exports or down-river traffic, 60 per cent is coal, 10½ per cent is manufactured iron. The traffic on the Dortmund-Ems Canal, which runs between the Westphalian coal fields and the North Sea, a distance of one hundred and fifty-five miles, amounted to 2,313,000 tons in 1908, and is largely composed of iron and ore up and coal down.

In France the same general policy toward waterway development has been pursued with one important difference: France does not impose upon the public the cost of transshipment between railroad and canal. As a result, very little transshipment occurs. Upon the other hand, all tolls and dues were abolished in 1880, and if the waterways were to be charged now with the carrying charges upon their total cost there would be an annual loss of interest of $14,400,000, computed at 4 per cent, to which should be added the annual cost of maintenance, making a total of $19,000,000 a year or

$2,500 per mile or 56 cents a ton on the total tonnage of 34,030,000 tons.[1] The result of this policy and of the increasing construction of canals has been a steady increase in the volume of waterway traffic since 1880.

Railroad traffic has also increased both generally and in bulk freight during the same period, but the water traffic has been maintained, not only by the public expenditures above mentioned, but by requiring the railroads to maintain rates 20 per cent higher than those available by water. The statistics for 1907 are interesting in showing that 29.5 per cent of the waterway traffic consisted of coal, coke, and briquettes, 36.3 per cent was stone, gravel, and lime, and only 3.3 per cent is listed as "industrial products." The percentage of agricultural produce, however, is 13.2 per cent—much higher than in Germany or in the United States—and the explanation for this is said to be the large quantity of wine which is shipped in casks.

The conclusions to be drawn from the foregoing statement of the various advantages of rail transportation, and from the brief survey of our own and foreign experience with water transportation, seem to me to be that some waterway expenditures are justified while others are not; and that the burden of proof has shifted from the opponents to the advocates of waterway development. Those of us who still believe that there is a place, and a great place, for navigable waterways in the most efficient and economical transportation system for this country should frankly accept the burden. We should abandon the easy generalizations and sweeping assumptions that have led to past mistakes and that are discrediting the cause of waterway development today. It is time to put our discussions upon a sounder economic basis and to confine our advocacy to those projects that can be supported by convincing evidence of practical utility. It is time to insist upon definite estimates of the available and potential traffic, to ascertain how this traffic can most efficiently be carried, to make certain that our engineering plans are fitted to commercial needs and methods instead of learning too late that commercial needs and methods cannot be coerced

[1] Moulton, *Waterways versus Railways*, p. 278.

into conformity with unwise engineering plans, to scrutinize our estimates of cost so that we may not find them far too low for the practical execution of the project. We must foresee and provide for the necessary terminal and transshipment facilities. We must provide in advance for the protection of the waterway against improper and destructive competition by the railway, and must provide for that correlation of rail and water upon which any large measure of waterway success depends. These are the lessons of our own experience and these are the lessons to be learned from Europe.

III

It is only when an artificial waterway (a waterway upon which substantial sums must be expended for construction and maintenance) is so situated with relation to the lines of existing or potential traffic that it can be made a more useful artery of commerce than other available agencies of transportation, that its development at public expense can be justified at all. Waterways do not furnish cheaper transportation than railways merely because freight rates by boat are less than freight rates by rail. It is only when the increased economies and facilities of transportation by water will not only pay a profit to the boatman but will also return to the public in reduced costs, or in other demonstrable ways, a margin over transportation by rail equal to the fixed charges upon the proposed expenditure upon the waterway that waterway development can be said to be economically sound. This does not mean that past expenditures upon waterways should be included in the capital account upon which an adequate future return is to be paid. Many huge expenditures have paid for themselves many times in the benefits which they have already conferred. Even those expenditures which have not thus far justified themselves must be ignored if after additional expenditures the results will justify the expenditure which yet remains to be made. Many calculations by the opponents of waterway improvement are based upon the improper inclusion of items which do not belong in the accounts. These calculations, however, should serve the useful purpose of compelling us to test every new waterway project in the light of past experience, and to adopt correct principles in determining upon the wis-

dom of future expenditures. All of us—public officials and private citizens, taxpayers and tax-spenders, shippers and consumers of freight—should have the keenest desire to learn why our past expenditures upon waterway development are now producing so little return, so that we may intelligently determine to what extent, in what manner, and upon what projects future expenditures for waterways should be made.

Is it cheaper to transport freight by water than it is by rail? If it is cheaper upon the Great Lakes, is it also cheaper upon the great rivers? If it is cheaper upon the great rivers, is it also cheaper upon canalized rivers and upon artificial canals? Why is it cheaper in one case and not in another? Can some kinds of freight be carried more cheaply or more advantageously upon all or some of these different kinds of waterways than the same kinds of freight can be carried by rail? What are the kinds of freight and the kinds of waterway which permit this to be done, and what are the reasons for the different results? How far are these results due to natural and persistent causes inherent in the conditions of economic and commercial development? How far are they the result of unsound methods, of obstacles that can and should be removed? How far can and should destructive competition give way to helpful co-operation between these two great agencies of transportation? Why should this country tolerate anything but effective co-operation between them? If water transportation between two points is cheaper than rail, why should we permit a railroad, by any tactics or actions whatsoever, to deprive these points of the benefits of the cheaper means of transportation? If water transportation between two points is not cheaper than rail, why should we spend the public moneys to create or to promote water transportation between these points? With either agency of transportation the inclusive cost of the service comes in one way or another from the pockets of the public. Why should we spend money upon either unless the particular expenditure is justified by convincing evidence of the benefits it will produce? We certainly should not permit a railroad to increase its general rates if it is cutting some of its rates below a fair margin of profit in order to stifle water competition, if it is buying boats in order to prevent them from running, if it is

running boats at a loss in order to destroy independent shipping, if it is holding undeveloped water terminals in order to prevent their use, if it is refusing to co-operate in the transshipment of freight and the making of reasonable joint rates. And is it not equally clear that we should not expend public moneys upon any waterways upon which freight cannot be carried as advantageously as it could be carried upon railroads if the same amount of public money were expended upon each? Is it not in each instance a question of which agency, water or rail, is, upon the whole, the cheapest and most efficient, considering in each instance the amount of money to be invested in the creation of the waterway and the railway, respectively, as well as the relative costs of equipment and operation? If railway rates must pay interest upon capital investment, must we not add to waterway rates an interest charge upon the public expenditures for the creation of the waterway before we can intelligently determine whether the waterway is really cheaper than the railway and whether the waterway appropriation is really a wise investment of public funds?

The present discussion is due largely to the proposed expenditure of public moneys by the state of Illinois for a waterway connection between the Great Lakes and the Gulf—between Chicago and New Orleans. It is therefore especially interesting to call attention to what is perhaps the most remarkable public expenditure in the history of this country—the construction of the important railway which connects another city with New Orleans. In 1869 the growing importance of the railroads and the relative decline of the waterways forced the city of Cincinnati to consider what it should do to protect and promote its commercial interests in securing adequate transportation facilities. It solved the problem by building, at its own expense, not a waterway, but a railway from Cincinnati to Chattanooga, which now constitutes an essential part of the Queen and Crescent Route connecting Cincinnati and New Orleans. Cincinnati did not cease to urge the expenditure of federal appropriations for the improvement of the Ohio River, but over all obstacles—legal, legislative, political, and financial, including the panic of 1873—the city persevered to the completion of what is now

described as "the highest earning per mile single-track railway in the United States." The railway owned by the city is nearly 336 miles long: 0.51 of a mile in Ohio, 197.50 miles in Kentucky, and 137.40 in Tennessee, with a right of way averaging 100 feet wide through these states. It cost approximately $30,000,000, as to which in 1912 the trustees stated that—

> The entire outstanding bonded, net interest-bearing debt of the city is but $14,932,000, from which property it is receiving annually as rental a sum sufficient to pay the entire interest charge upon said bonded indebtedness, and in addition apply over a half-million dollars to the general interest fund of the city.

The railway is operated under a lease to the Cincinnati, New Orleans & Texas Pacific Railway Company which expires in 1966. The annual report of that company for the year 1914 shows the payment of 5 per cent dividends on the preferred stock and 11 per cent dividends on the common stock, with a balance of $6,075,-254.44 to the credit of the profit and loss account. A careful analysis of the financial accounts of this company would undoubtedly show that the Cincinnati Southern Railway (owned by the city) is one of the most profitable railroad properties in the United States. I can undertake no comparison of the relative benefits to the city of Cincinnati from this railroad and from the improvement of the Ohio River. It is not at all necessary to reach conclusions that would exclude the one or the other avenue of transportation. The real significance of the Cincinnati enterprise is that any community is and should be free to adopt the best available means of transportation, whether it be rail or water. If the future demands of commerce are likely to overtax the existing railways, and if private capital declines to meet these demands, the public is not necessarily driven to the waterway as the only means of relief. If the railway is indeed the best means of relief, it is an available means. If a combination of railway and waterway constitutes the best transportation system, that is the system we should adopt. What is essential is that we should intelligently determine in every instance what agency or what combination of agencies will serve the public best, remembering always that expenditures for railways and

expenditures for waterways are in the last analysis the expenditures of the public. Because freight rates on toll-free waterways are low, we must not deceive ourselves into regarding these rates as the real cost of water transportation. Because railroads are still in private ownership, we must not deceive ourselves into regarding them as anything but publicly supported agencies of commerce.

The highest courts of the land have explicitly set the stamp of their approval upon the economic principle that railways, whether in public or in private hands, are agencies of government and are performing governmental functions. Their expenditures are in all essentials public expenditures, just as much as are the appropriations for the improvement of internal navigation. This is indeed the underlying explanation of and justification for public grants in aid of railroads and for governmental regulation of railroad rates, services, and capitalization. The great outstanding fact of our recent transportation development is that railway rates are now being horizontally increased with the approval of the Interstate Commerce Commission, upon the ground, not only that operating charges must be paid, but that railroad capital is entitled to a fair return, and that railroad credit must be maintained to attract new capital. It is perfectly true that the service which the railroads are now giving is not the service they gave under other conditions and other rates, but when we are insisting upon improved service and increased capital expenditures upon the one hand and are consenting to increased rates upon the other, the argument that waterways are necessary or desirable as regulators of railway rates loses much of its force. If railway rates as a whole are not to be reduced but are to be increased because the net return to the railways is inadequate, the burden of rate reductions secured by water competition is merely shifted to traffic or to localities which cannot use water transportation. This can be justified only by the actual economies of particular waterways and by permitting each section or community to have whatever advantages can be derived from its natural location—a concession which has been very grudgingly admitted in the United States. It certainly raises the fundamental economic issue as to how far the natural advantages of particular localities or sections are to be equalized by the system of differential

rates upon which the commerce of this country has been built and is now being conducted.[1]

IV

Any discussion of the merits of the proposed eight-foot waterway project between Lockport and Utica is at this time largely academic; for it is after the event. The bill has been passed and will doubtless be signed by the Governor. Nevertheless, it may serve a useful purpose to call attention to some of the essentials of a successful waterway policy which have not yet been provided for in connection with this legislation. If five million dollars of the public moneys is to be expended upon this project it is of the greatest importance that it shall not fail because of any neglect or oversight. Personally I am in full accord with the general conclusion that so long as the channel of the Mississippi River below St. Louis is maintained at only eight or nine feet an eight-foot channel between Chicago and St. Louis is all that can be justified. The real question is not whether eight feet is preferable to fourteen or twenty-four feet, but whether an eight-foot channel will attract sufficient traffic to justify the proposed expenditure of public money.

The first point to be noted about the eight-foot project between Lockport and Utica is that no proper estimate of the cost of the project has been made. Certainly no detailed estimate is available to the general public so that it may be analyzed and scrutinized as

[1] The testimony in the General Railroad Rate Advance Case before the Interstate Commerce Commission in 1910 developed an interesting illustration of present railroad practice. Some time ago the business of manufacturing so-called emery wheels (abrasives) was developed in Massachusetts where crude materials brought by ocean from Europe were the basis of the manufacture. In the course of time a substitute crude material was discovered in Arkansas. Instead of moving the seat of manufacture nearer to the source of supply of the crude materials, the railroads bring these crude materials all the way from Arkansas to Massachusetts and permit milling in transit at Niagara Falls, where the ore is treated by electrical power and then taken on to Massachusetts to be worked into the finished product. Some 62 per cent of the finished product is then transported back to the territory west of Buffalo and Pittsburgh, where it finds its market. In view of the fuel and water power available in the Mississippi Valley and even in Arkansas, the interesting economic question is whether the interests of the entire community would not be better served if the railroads did not make the special rates under which alone the long-distance transportation of the crude materials is commercially possible.

such an estimate should be. No specific allowance for property damages appears on the face of the estimate. The bill contains an item of $318,250 "for right of way and damage to land," but no provision whatever is made in the estimate or bill for terminal facilities. The importance of these estimates is disclosed by the recent financial history of the Erie Canal. In 1903 the state of New York appropriated $101,000,000 for the rehabilitation of the state canal system. The cost of engineering and construction has so much exceeded the original estimates that the appropriation has already been exhausted, and the State Engineer has recently estimated that it will require an additional $27,000,000 to complete the project. Even this estimate is based upon the possibility of settling for $25,000,000 existing claims for land, water, power, and other damages amounting to $72,700,000. The original appropriation made no provisions for dock, wharves, and transshipping machinery absolutely essential as terminal facilities. Finally, in 1911 the state appropriated $19,000,000 for the purpose of constructing terminals at New York and Buffalo and at about fifty intermediate towns. It is seriously questioned whether this appropriation will be in any way adequate for this all-important purpose.

The plans for the Erie Canal and the plans for the Lockport-Utica Canal are alike in one important particular. In neither case, apparently, was there any adequate investigation and determination of the type of boat which is best adapted for the available traffic. In Germany the 600-ton barge is regarded as the demonstrated type of highest efficiency when all elements have been taken into consideration. For such barges a waterway depth of seven feet is abundantly sufficient. A depth of eight feet is adequate for barges of 1,500 to 2,000 tons burden. But the Erie Canal is to be widened, with a depth of twelve feet. This additional depth involves an enormous increase in the cost, and appears to have no economic or commercial justification. It is not large enough for lake boats, and it seems unnecessarily large for canal barges. The question of the size and type of the boat is of fundamental importance in determining the size and character of locks, the radii of curves, and other important engineering details. The engineering report on the Lockport-Utica Canal appears to be based on no

determination of this question. Prominent advocates of the project have expressed their conviction that the proper navigation of this canal in connection with the Lower Mississippi River will be by means of barges of approximately 600 tons operated in fleets, one barge equipped with power towing the others. On the other hand, the published address of Governor Dunne says: "Self-propelled barges carrying from one thousand to two thousand tons of freight can and will operate over this waterway between Chicago and New Orleans to the great benefit of the people of the Mississippi Valley if this important waterway be constructed and placed at the disposal of the people."

The Governor also refers with confidence to the development of electrical power at Joliet and at Starved Rock, but I note that the report of the engineers omits all estimates of the cost of the power plant at Starved Rock.

It is apparent on the face of the report that the Sanitary District of Chicago is expected to make large expenditures in addition to those which the state itself is making directly. The expenditures of the Sanitary District of Chicago have already grown from an original estimate of $16,000,000 to a total now approximating $70,000,000, and many important and expensive items of work remain to be completed, at the very time that the ablest sanitary engineering advice obtainable is making an exhaustive report which reaches the conclusion that the whole system of sewage disposal by dilution at Chicago is a mistake and should be entirely abandoned.

It must be remembered also that there has been no investigation or estimate of the kind and quantity of traffic that can be developed by the Lockport-Utica Canal, and no real consideration has been given to the preliminary arrangements that should be carefully worked out and effectively provided for securing the proper correlation of the railroads and the waterway. These omissions do not necessarily lead to the conclusion that the project is not essentially sound or that its engineering and commercial difficulties cannot all be met; but we must not add one more to the list of unsuccessful and discredited waterways, if it is possible by taking hold of all of these matters vigorously and at once to determine whether they can be met and in what manner.

It is easy to assert that the saving on lumber freights to Chicago from the Lower Mississippi and its tributaries will justify the expenditure upon the canal, but the history and present condition of the lumber trade in the Mississippi Valley lead to the suspicion that these benefits would be limited to the lumber dealers who could ship a comparatively small amount of lumber from mills located directly on water on the Lower Mississippi. The cost of transshipment of lumber which must first be loaded into cars and taken to the Mississippi River or its tributaries to be transferred to boat will interfere with water shipments of that particular class just as transshipment costs are now interfering with shipments of this character between the Lower Mississippi and St. Louis. In the five years beginning in 1902 and ending in 1906 the receipts of lumber at St. Louis by river diminished from 52,000,000 feet to a little over 5,000,000 feet, only a small fraction of the total lumber traffic of St. Louis.[1] An enormous advantage which the railroads possess in the matter of distance—direct shipment from the upper reaches of the lower tributaries of the Mississippi to St. Louis and Chicago instead of shipments by water down these tributaries and then up the Mississippi River against the current—has determined and doubtless will continue to determine the transportation of this commodity. The water distance is from two to three times that by rail and the ton-mile water rates must therefore be only from one-half to one-third those by rail to place them on a parity.

The receipts of cotton by river at St. Louis dwindled to 3,039 bales in 1905, while 546,876 bales were received there by rail.[2] The enormous coal traffic of the Ohio River is largely due to the fact that the barges can be loaded directly from the mines on the upper reaches of that river and its tributaries. It is difficult to see how any considerable coal trade can be developed on the upper half of the Lakes-to-the-Gulf waterway, for the mines are not located directly on the canal route. In consequence, transshipment becomes necessary from rail to water, the cost of which is usually prohibitive.

[1] *Report of the Inland Waterways Commission*, p. 157.

[2] *Ibid.*

Grain is the only agricultural product for which water transportation offers any considerable inducement, and the cost of transshipment, the risk of damage, and other elements tend strongly to overcome all economies in the mere transportation cost by water. Agriculture is a decentralized industry. In the very nature of the case agricultural products are raised over wide stretches of territory, and the railroads are able to cover this territory and to collect the produce far more efficiently than waterways can possibly do. Once the produce is loaded on the rails it tends to remain there. Both in this country and in Europe the most efficient and successful waterways carry relatively small amounts of agricultural products. It is only in the case of importations of grain that the waterways offer decided advantages in Europe. In the collecting and marketing of native agricultural produce it is freely admitted that the railways have a decided advantage. It has been believed that considerable shipments of manufactured iron and steel would be made over the Lakes-to-the-Gulf waterway from Chicago; but the traffic manager of the Illinois Steel Company is quoted as stating that he could make no use whatever of the Lakes-to-the-Gulf waterway even if it were more than twenty feet in depth.[1] This statement may be explained by the special advantages of railroad transportation secured by these steel interests through the ownership of terminal rail connections; but the fact remains that in 1910 only 43,000 tons of manufactured iron went out by water over the Great Lakes from this great center of the iron industry. Of the 8,800,000 tons of lake freight received at Chicago in that year more than 7,000,000 tons consisted of coal and iron ore; and this does not include the 1,170,000 tons of ore received at Gary. Of the 2,700,000 tons shipped by lake from Chicago, 2,000,000 tons consisted of grain and grain products.[2]

Undoubtedly the lake traffic and the shipment of merchandise freight especially has been largely controlled and restricted by the

[1] W. A. Shelton, "The-Lakes-to-the-Gulf Deep Waterway," *The Journal of Political Economy*, July, 1912, p. 656.

[2] On the other hand, it is interesting to note that in 1914 only 15.32 per cent of the total freight traffic of the railways of the United States is listed as "manufactures" and 4.33 per cent as "merchandise," while 51.83 per cent is listed as "products of mines." The first two percentages are the highest of their class since 1907, while the last percentage is the lowest in that time.

railroads, which have acquired the principal boat lines and the principal terminals and obstructed transshipment and manipulated rates. The Interstate Commerce Commission is compelling the railroads to dispose of their boat lines on the Great Lakes, but this will not materially change competitive conditions between Chicago and New Orleans. It certainly offers no such program as is absolutely essential to the success of the proposed waterway. The very important fact remains that there has been no adequate investigation of traffic possibilities for the route, and that no constructive scientific waterway policy, embracing the manifold aspects of the problem as a whole, has been evolved. We have an appropriation for the Illinois link in a Lakes-to-the-Gulf waterway at last, but so far as any scientific analysis of the transportation problem is concerned we have made practically no advance. If we are to avoid in the future the painful necessity of continued explanations of why waterway transportation is a failure, it is necessary for us to begin now to supersede guesswork and generalized assumptions by impartial and comprehensive analysis, and by provision in advance for those physical and financial co-operative relations between waterway and railway that are absolutely essential to real success in water transportation.

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